Line 9, delete "wherein the" and insert --. The--;

Lines 19-20, delete "the product of Shore D hardnesses of inner and outer cover layers:";

Lines 22-23, delete "the product of Shore D hardnesses of inner and outer cover layers:";

Lines 25-26, delete ""the product of Shore D hardnesses of inner and outer cover layers:";

Lines 28-29, delete "the product of Shore D hardnesses of inner and outer cover layers:";

Lines 31-32, delete "the product of Shore D hardnesses of inner and outer cover layers:";

Line 33, delete "," and insert --.--;

Line 34, (start the sentence after the period above) delete "and the" and insert --The--.

REMARKS

This response follows an Office Action of October 8, 1999, rejecting claims 1-3. The petition and fee associated with an extension of time for two months is attached.

Applicant notes with appreciation that the Examiner has acknowledged receipt of the priority document under 35 U.S.C. § 119.

The specification has been reviewed and revised. The abstract has been shortened in accordance with the Examiner's suggestions. A new figure, Figure 4, has been added showing a cross-section of the golf ball. Appropriate legends have been added setting forth the salient parameters of the claims.

The Applicant has canceled claim 1 and added new independent claim 4. Claim 2 has been canceled as redundant and the dependency has also been changed. New dependent claims 5-15 have been added setting forth preferred parameters of Applicant's invention. The antecedent basis for each of those claims is found in the specification as filed. The ranges of distortion found in new claim 4 and in claim 5 are presented on page 5, beginning at line 25 through line 29. The dimensional parameters for the hardness of the inner and outer layers is set

forth on page 6. The dimensional parameters of thickness are set forth on page 7, lines 5-9. The values of dimple diameter, depth and volume ratio V_0 are set forth on page 10. Consequently, each new claim is supported by the specification as filed.

Additionally, claim 4 defines a multi-piece golf ball as having a cover consisting of inner and outer layers. Applicant thus defines specifically a three-piece golf ball.

The claims stand rejected on two basis. The first relies on Yamagishi `563. The Examiner contends that claims 1-3 are either anticipated by or rendered obvious over that reference. The Examiner also holds that differences in dimples are apparently, in the Examiner's view, ornamental design variance of the Yamagishi golf ball. Secondly, the claims stand rejected as being unpatentable over Sullivan et al. `087 in view of Ihara et al. `381. The Examiner contends it would have been obvious to provide Sullivan with dimple parameters as set forth in the secondary reference. Both of these rejections are respectfully traversed. Based on the remarks that follow, when taken with the amendments to the claims, reexamination and reconsideration is respectfully requested.

This present invention provides a golf ball comprising a solid core enclosed with an inner and outer layer enabling an increase in flight distance.

Making extensive investigations to achieve the above object, the inventors have found in connection with a multi-piece solid golf ball comprising a solid core and a cover of two inner and outer layers surrounding the core, the outer cover layer being formed in the surface with a plurality of dimples, that a spin rate is approximately explained in terms of a product of the Shore D hardness of the inner cover layer multiplied by the Shore D hardness of the outer cover layer. That recognition does not exist in the prior art.

More particularly, a greater spin rate is obtained when the product of the Shore D hardnesses of the inner and outer layers has a relatively small value. Inversely, a smaller spin rate is obtained when the same product has a relatively larger value. Accordingly, effective means for taking full advantage of the spin property dependent on the product of the Shore D hardnesses of the inner and outer layers and improving the flight performance of the golf ball is to divide the range of the product into sub-ranges and form dimples to satisfy the following requirements associated with the sub-ranges of the product. Again, that recognition does not exist in the prior art.

More particularly, it has been found effective to specify a proportion V_R (%) of the total of the volumes of dimple spaces each defined below a plane curcumscribed by the dimple edge to the overall volume of a phantom sphere given on the assumption that the golf ball surface is free of dimples. The inventors have further found that to specify the distortion of the solid core is effective to achieve the object of the present invention.

It should be noted that the combination of the above elements is essential to achieve the object of the present invention. Reference is made to Example 1 on page 15 of the specification, and the golf ball of Comparative Example 1 on page 16 of the specification. Both have the same product of the Shore D hardness of the cover layers but a different value V_R compared to Example 1. It lofts too high and is inferior in flight distance performance. The comparison between Example 3 and Comparative Example 2 and the comparison between Example 4 and Comparative Example 3 yield the same results.

Yamagishi et al. disclose a multi-piece solid golf ball comprising a solid core and a cover of at least two layers enclosing the core and having a number of dimples in the surface of a cover

outer layer: V_0 is in the range of 0.4 to 0.65, and the core experiences a distortion of 2.0 to 5.0 mm under a load of 100 kg. The cover outer layer has a Shore D hardness of 40 to 68.

However, Yamagishi et al. fail to disclose a product of the Shore D hardness of the inner cover layer multiplied by the Shore D hardness of the outer cover layer, thereby a spin property dependent on the product of the Shore D hardnesses of the inner and outer layers and improving the flight performance of the golf ball. Yamagishi et al. further fail to disclose a proportion V_R (%) of the total of the volumes of dimple spaces each defined below a plane circumscribed by the dimple edge to the overall volume of a phantom sphere given on the assumption that the golf ball surface is free of dimples.

The Examiner is directed to the tables of examples of Yamagishi et al. and to the calculations attached herewith, wherein the product of the Shore D hardness and the value V_R are set forth. As seen from the tables, the examples of Yamagishi et al. do not satisfy the elements of the present invention which are a distortion of the solid core 2.8 to 6.5 mm under an applied load of 100 kg and a particular proportion V_R (%) to a particular product of the Shore D hardness.

Specifically, examples 1 and 2 of Yamagishi et al. satisfy V_R: 0.8 to 1.1% to the product of Shore D hardnesses of inner and outer cover layers: 1,500 to less than 2,000. But, the examples do not satisfy a distortion of 2.8 to 6.5 mm under an applied load of 100 kg. Example 3 also satisfies V_R: 0.75 to 1.05% to the product of Shore D hardnesses of inner and outer cover layers: 2,000 to less than 2,500. However, that example does not satisfy a distortion of 2.8 to 6.5 mm under an applied load of 100 kg. Example 4 satisfies the distortion of 2.8 to 6.5 mm of the present invention, however, the product of Shore D hardnesses of cover layers is 3445 and the value V_R is 0.996. The example does not satisfy the V_R: 0.7 to 1% to the product of Shore D

hardnesses of cover layers: 2,500 to less than 3,000 or the V_R: 0.65 to 0.95% to the product of Shore D hardnesses of cover layers: 3,000 to less than 3,500. Therefore, the golf ball of the claimed invention is significantly different from the ball of Yamagishi et al.

Sullivan et al. is no more pertinent. It discloses a multi-layer golf ball having a central core, an inner cover layer having a Shore D hardness (ASTM D-2240) in the range of 1.65 and an outer cover layer having at least about 60 (ASTM D-2240).

However, Sullivan et al. fail to disclose and teach the proportion V_R (%) of dimples. Specifically, it is difficult for the multi-layer golf balls of Sullivan et al. obtain the equal effect to the present invention because the golf balls of Sullivan et al. do not have the dimples of the particular proportion V_R (%) to the product of the Shore D hardness of the inner cover layer multiplied by the Shore D hardness of the outer cover layer.

Ihara et al. disclose a golf ball having a plurality of recessed dimples on the surface thereof wherein the golf ball is a large sized two-piece ball consisting of a core and a cover; at least 90% of the dimples have a value of V_0 in the range defined by the following equation: $0.35 \leq V_0 \leq 0.47$ wherein V_0 is a ratio equal to the volume of each dimple confined below a plane which is defined by dimple edge divided by the volume of a cylinder whose bottom is defined by said plane and whose height is defined by the maximum dimple depth from the bottom.

However, the golf balls disclosed by Ihara et al. are two-piece golf balls consisting of a core and a cover, and a thread-wound ball consisting of a center, a thread rubber and a cover. The structure of the golf ball of Ihara et al. is different from that of the present invention. In addition, Ihara et al. fail to disclose a product of the Shore D hardness of the inner cover layer multiplied by the Shore D hardness of the outer cover layer.

Accordingly, even if Sullivan et al. is combined with Ihara et al. the resulting golf ball will not have the attributes of claimed invention.

Thus, it is respectfully contended that Applicant's invention is patentably distinguishable over the references as cited and combined by the Examiner. In particular, the Examiner has pointed to Yamagishi `563 and the Applicant has demonstrated that when the technology of that reference is extrapolated to the parameters set forth here, the reference falls outside the scope of this invention. Moreover, it is demonstrated that the reference falls closer to the Comparative Examples which yield inferior results. Consequently, it is believed that that reference has been distinguished. With respect to the combination of Sullivan in view of Ihara, it is believed that the combination, even if amenable to modification of Sullivan falls well short of defining subject matter consistent with the scope of this invention. The allowability of the claims is therefore respectfully requested. Should the Examiner have any questions, he is requested to contact the undersigned attorney of record at the local exchange listed below.

Please charge any fee, except for the Issue Fee, that may be necessary for the continued pendency of this application to our Deposit Account No. 19-4880.

Respectfully submitted,

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Date Filed: March 8, 2000

The tables of the examples of Yamagishi et al.
(wherein the product of hardness of two cover layers and the V_R are calculated.)

		E1	E2	E3	E4	CE1	CE2	CE3
Structure		3P	3P	3P	3P	2P	3P	3P
Core: Distortion under 100 kg load		2.2	2.2	2.6	3.3	2.5	2.2	4
Inner cover	type	a	a	a	b	-	a	a
	Shore D hardness	40	40	40	65	-	40	40
Outer cover	type	A	A	B	B	C	A	D
	Shore D hardness	45	45	53	53	55	45	65
A product of Shore D hardness of cover layers		**1800**	**1800**	**2120**	**3445**	**-**	**1800**	**2600**
Dimple type		I	II	I	II	I	III	I
V_R		**1.014**	**0.996**	**1.014**	**0.996**	**1.014**	**0.670**	**1.014**

Dimple type	Diameter (D_m) mm	Depth (D_p) mm	V_o	Number	V_q	V_p	V_s	V_R
I	4.100	0.210	0.500	54	2.773	1.386	413.388	**1.014**
	3.850	0.210	0.500	174	2.445	1.222		
	3.400	0.210	0.500	132	1.907	0.953		
II	4.150	0.210	0.480	54	2.841	1.363	405.826	**0.996**
	3.850	0.210	0.480	174	2.445	1.173		
	3.500	0.210	0.480	132	2.020	0.970		
III	3.650	0.195	0.390	150	2.040	0.796	273.016	**0.670**
	3.500	0.195	0.390	210	1.876	0.732		

Note: Each value V_R is calculated by the described equations in the present specification.

$$Vq = \frac{\pi Dm^2 Dp}{4}$$

$$V_0 = \frac{Vp}{Vq}$$

$$Vs = N_1Vp_1 + N_2Vp_2 + \ldots + N_nVp_n = \sum_{i=1}^{n} N_i Vp_i$$

$$V_R = \frac{Vs}{\frac{4}{3}\pi R^3} \times 100$$